

REMARKS

This is in response to the final Office Action mailed August 25, 2008 and incorporates the proceedings of the telephonic Examiner Interview that took place on January 15, 2009.

With this amendment, claims 1, 2 and 58 have been amended. Claims 64 and 65 have been added. The Applicant has carefully and thoughtfully considered the Office Action and the comments therein. For the reasons given below, it is submitted that this application is in condition for allowance.

35 U.S.C. § 102 Rejections

(1) In the Office Action on page 2, claim 58 is rejected under 35 U.S.C. § 102(b) as being anticipated by C.N. Iverson and W.D. Jones, “Rhodium-Catalyzed Activation and Functionalization of the C-C Bond of Biphenylene” (hereinafter “Iverson”). The Applicant respectfully traverses the rejection.

As amended, claim 58 recites, *inter alia*, “wherein the R bridging group is i) an alkylene selected from the group consisting of ethylene and substituted variants thereof, propylene and substituted variants thereof, and butylene and substituted variants thereof; or ii) A-Ar-B, in which Ar is an optionally substituted aryl moiety to which A and B are linked on available adjacent carbon atoms, and A and B each independently represent lower alkylene.” In contrast, the teachings of Iverson are limited to a catalyst system in which **the R group is methylene** (p. 5745). Thus, Iverson fails to teach, or fairly suggest, each and every limitation of claim 58. Accordingly, claim 58 is allowable over Iverson, and the rejection should be withdrawn.

(2) In the Office Action on page 2, claim 58 is rejected under 35 U.S.C. § 102(b) as being anticipated by P. Hofmann et al., “Bis(di-t-butylphosphino)methane complexes of rhodium:

homogeneous alkyne hydrosylylation by catalyst-dependent alkyne insertion into Rh-Si or Rh-H bonds. Molecular structures of the dimer [(dtbpm)RhCl]₂ and of the silyl complex (dtbpm)Rh[Si(OEt)₃](PMe₃)” (hereinafter “Hofmann”). The Applicant respectfully traverses the rejection.

As amended, claim 58 recites, *inter alia*, “wherein the R bridging group is i) an alkylene selected from the group consisting of ethylene and substituted variants thereof, propylene and substituted variants thereof, and butylene and substituted variants thereof; or ii) A-Ar-B, in which Ar is an optionally substituted aryl moiety to which A and B are linked on available adjacent carbon atoms, and A and B each independently represent lower alkylene.” In contrast, the teachings of Hofmann are limited to a catalyst system in which **the R group is methylene** (e.g., p. 52). Thus, Hofmann fails to teach, or fairly suggest, each and every limitation of claim 58. Accordingly, claim 58 is allowable over Hofmann, and the rejection should be withdrawn.

35 U.S.C. § 103(a) Rejection Based on Fox

(3) In the Office Action on page 3, claims 60 and 62 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 4,504,684, to Fox et al. (hereinafter “Fox”). The Applicants respectfully traverse.

Claims 60 and 62 are non-obvious over the references cited. Fox teaches a gas-phase reaction employing a polymeric heterogeneous catalyst (Col. 1, lines 45-50), for the purpose of avoiding the loss of catalyst that occurs during liquid-phase reactions (Col. 1, lines 14-23, 45-50). And the ligands taught in Fox are non-chelating (Col. 3, lines 16-28). In contrast, the claimed reaction medium and process occur in the liquid phase, and the recited bidentate compound will

tend not to polymerize due to, for example, the substitution pattern on the Ar ring and/or the length of the alkylene substituent (see also new claims 64 and 65). Furthermore, the catalyst system employed in the claimed processes will permit chelation. Accordingly, Fox is incompatible with the claimed processes. Furthermore, Fox leads a person away from modifying its teachings in the manner suggested in the Office Action to arrive at the claimed processes.

During the telephonic Examiner Interview of January 15, 2009 (“Interview”), the Examiner indicated that he agreed with the above points and that Fox is thus inapplicable to the pending claims.

Therefore, claims 60 and 62 are nonobvious over Fox. Applicants respectfully request that this rejection be withdrawn.

35 U.S.C. § 103 Rejection Based on Fox in view of X.L. Wang

(4) In the Office Action on pages 4-6, claims 1-47, 51-55, 61 and 63 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Fox in view of U.S. Pat. No. 6,348,621, to X.L. Wang et al. (hereinafter “X.L. Wang”). The Applicants respectfully traverse.

Claims 1-47, 51-55 61, 63 and 64-65 are non-obvious over the references cited. For example, a person of ordinary skill in the art would not combine the cited references because they employ incompatible reaction conditions. Indeed, Fox teaches away from the combination suggested in the Office Action. Moreover, the combination fails to disclose or suggest every element of the claims. Accordingly, the claims are patentable over any reasonable combination of Fox and X.L. Wang.

Independent claim 1 recites “A process for the hydroformylation of ethylenically unsaturated compounds, which process comprises reacting said ethylenically unsaturated compound with carbon monoxide and hydrogen, in the presence of a catalyst system, the catalyst system obtainable by combining: a) a Group VIII metal compound; and b) a bidentate compound of general formula (Ia) . . . wherein: R is a bridging group selected from the group consisting of: an alkylene group; and A-Ar-B, in which Ar is an optionally substituted aryl moiety to which A and B are linked on available adjacent carbon atoms, and A and B each independently represent lower alkylene; R¹ to R¹² each independently represent lower alkyl, aryl or Het; Q¹ and Q² each independently represent phosphorus, arsenic or antimony, the process characterised in that a chlorine moiety is present in at least said Group VIII metal compound.” Independent claim 2 is similar to claim 1 in aspects relevant here.

Fox is discussed above. For the reasons detailed there, Fox is incompatible with the claimed processes, and furthermore, Fox leads a person away from modifying its teachings in the manner suggested in the Office Action to arrive at the claimed processes.

As noted above, during the Interview, the Examiner indicated that he agreed with the above points and that Fox is thus inapplicable to the claims.

The Examiner nevertheless alleged that the claims are not in condition for allowance because a further search would uncover other references that could be substituted for Fox as a primary reference against the claims. However, Applicants point out that unless such a reference discloses a bidentate ligand comprising tertiary carbons bound to the phosphine or similar substituent, and also discloses the inclusion of a chlorine moiety so as to bring about unexpectedly superior selectivity for linear versus branched product, all in the context of a solution-phase

hydroformylation reaction, then the reference would be insufficient to support a rejection against the claims.

The claimed invention teaches, e.g., processes for the hydroformylation of ethylenically unsaturated compounds. The claimed bidentate compound comprises tertiary carbons bound to Q1 and Q2, and the process occurs with a chlorine moiety present either in the solvent or in the Group VIII compound. Furthermore, the claims require inclusion of the chlorine moiety to give rise to unexpectedly superior selectivity for linear product over branched product. For example, the specification states that “the process of the invention will show an increased selectivity to the linear aldehyde product, compared to the branched aldehyde product, in comparison with similar processes but where the chlorine moiety is not present.” (Specification, p. 28). The Examples provide experimental evidence of the unexpectedly superior selectivity for linear product brought about by the presence of the chlorine moiety. See, for example, Example 1 and Comparative Example 1, which describe the hydroformylation of 1-hexene via the claimed processes. Specification, pp. 56-57. Example 1, in which a chlorine moiety is included in the Group VIII metal compound, produced a linear-to-branched ration (hereinafter “l:b ratio”) of 5.25:1. In contrast, Comparative Example 1, without a chlorine moiety, produced an l:b ratio of just 1.22:1. See also Examples 4-7 and Comparative Example 2, pp. 58-60 (in the hydroformylation of 1-octene, reactions run in the presence of a chlorine moiety produced l:b ratios of 4:1, whereas the non-chlorine reaction produced an l:b ratio of just 1:1).

Fox fails to disclose the claimed processes. Furthermore, any reference that fails to teach, for example, a solution-phase hydroformylation process comprising the claimed ligand including tertiary carbons, and also including a chlorine moiety in either the Group VIII metal compound or

the solvent that gives rise to unexpectedly superior selectivity over linear versus branched product, will also be insufficient to support a rejection against the claims, and may also be insufficient for other reasons.

X.L. Wang fails to cure the above-noted defects. X.L. Wang discloses a process for the carbonylation of ethylene using a catalyst system comprising a generic bidentate phosphine. Abstract. However, X.L. Wang does not disclose or suggest the claimed processes for at least the following reasons. First, X.L. Wang's process produces only the corresponding carboxylic acid or ester (Col. 4, lines 6-10). X.L. Wang does not disclose or suggest any utility in producing aldehydes, as in the claimed hydroformylation processes. In fact, X.L. Wang teaches that the carbonylation reaction can work in the presence of hydrogen and carbon monoxide (see Col. 3, lines 15-18), the starting materials in the claimed processes used for hydroformylation. This suggests that there is no expectation that the catalyst and process described in Wang could achieve hydroformylation as required by the present claims. Second, X.L. Wang only discloses effectiveness on ethylene (see Col. 1, lines 41-45), not on ethylenically-unsaturated compounds generally, as in the claimed processes. Third, X.L. Wang does not disclose or suggest the unexpectedly superior selectivity for linear product brought about by including chlorine in the claimed processes.

For at least the reasons set forth above, the Office Action fails to set forth a *prima facie* case of obviousness. Therefore, claims 1 and 2 are nonobvious over the references cited. Claims 4-47, 51-55, 61, 63 and 64-65 are dependent from claim 1 and are allowable as being dependent from an allowable claim. Similarly, claim 3 depends from claim 2 and is allowable as being dependent from an allowable claim. Therefore, the rejections should be withdrawn.

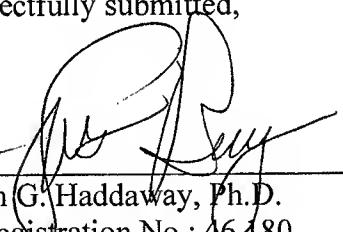
CONCLUSION

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is hereby invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment is respectfully requested.

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Respectfully submitted,

By 
Keith G. Haddaway, Ph.D.
Registration No.: 46,180
Thomas F. Barry
Registration No.: 57,586
VENABLE LLP
P.O. Box 34385
Washington, DC 20043-9998
(202) 344-4000
(202) 344-8300 (Fax)
Attorney/Agent For Applicant

DC2/1010794